negotiation and conflict management research

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Addressing Organizational Cultural Conflicts in Engineering with Design Thinking

Sean M. Eddington,[1] Danielle Corple,[2] Patrice M. Buzzanell,[3] Carla Zoltowski[4] and Andrew Brightman[5]

1 Department of Communication Studies, Kansas State University, Manhattan, KS, U.S.A.
2 Department of Communication, Wheaton College, Wheaton, IL, U.S.A.
3 Department of Communication, University of South Florida, Tampa, FL, U.S.A.
4 Department of Practice of Electrical and Computer Engineering, Purdue University, West Lafayette, IN, U.S.A.
5 Department of Biomedical Engineering, Purdue University, West Lafayette, IN, U.S.A.

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Correspondence
Sean M. Eddington, Department of Communication Studies, Kansas State University, Manhattan, KS, U.S.A.; e-mail: seaneddington@ksu.edu.

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Abstract

The present study examined how design thinking processes help to facilitate difficult conversations for fostering organizational change toward greater inclusion and equity in undergraduate engineering programs. Regardless of the type of organization or institution, sustainable diversity and inclusion integration requires difficult conversations that can correspond with locale-specific interventions and deep cultural transformation. We led a series of design sessions with stakeholders from two undergraduate engineering programs at a large, Midwestern, research university aimed at creating prototype solutions to diversity and inclusion problems. Following the sessions, we conducted interviews with 19 stakeholders to understand their perceptions of the design process in facilitating both difficult conversations and in enacting meaningful change. Our study uncovered that organizational cultures impacted participants' perceptions of change possibilities and their role in change. We conclude with recommendations for adopting design practices and communication-as-design processes to create structures and interactive approaches for facilitating conversations toward inclusionary organizational change.

Our study investigates communicative design frameworks that might be leveraged to illuminate, understand, and address ongoing and controversial organizational issues like diversity and inclusion. We present a contrastive case study of two organizational cultures that participated in a design thinking process aimed at inclusionary change. Given the prevalence of recurring and intractable diversity, inclusion, and equity problems in a variety of organizational settings, we argue that design thinking processes can be a useful framework to surface and engage meaningful inclusionary change efforts. Our study highlights the impact of design processes and tools that unearth challenging (and often unspoken) issues while centering empathic understanding to address, design, and implement change efforts in engineering disciplines.

Despite increasing attention to organizational diversity (e.g., representation) and inclusion (e.g., belonging) conflicts, organizational leaders and stakeholders have struggled to fully integrate diversity and inclusion (D&I) into their organizational contexts (e.g., government, and schools). In many cases, D&I topics and conversations are minimized or met with skepticism, disregard, or outward hostility (Buzzanell, 2017; Fiske, 2012; Sue, 2010). As such, addressing issues related to D&I can be controversial, difficult, and enduring; they are "wicked problems." Wicked problems are challenging to define and

remedy. They are often unspoken, have no definitive solution, and are a "symptom of another, "higher level," problem" within organizational cultures (Buchanan, 1992, p. 16). They are comprised of seemingly intractable issues that are "persistent and destructive despite repeated attempts at resolution," which can be challenging to both surface and address (Gray, Coleman, & Putnam, 2007, p. 1416).

One way to address and engage wicked problems is through design thinking. Design thinking creates opportunities for dialogue, encourages change through creative and innovative solutions, and, most importantly, utilizes frameworks that aid in communication across differences (e.g., political, ideological, demographic; Buzzanell, 2017; Zoltowski, Buzzanell, Brightman, Torres, & Eddington, 2017). Design thinking centers understanding, empathy, and observations of human needs to address abstract, complex, and intractable enactments of conflicts like D&I issues (Brown, 2008, 2009).[1] Thus, this study examines how enduring "wicked problems" that negate D&I efforts in organizations can be both highlighted and transformed vis-à-vis design thinking.

For the context of this study, we focus on organizational cultures in engineering educational programs as they are particularly difficult spaces to adequately and meaningfully integrate D&I. In engineering educational programs, D&I issues are often framed as "numbers" issues or pipeline problems that can be solved by more inclusive recruitment strategies. These arguments contend that increasing the numbers of women and underrepresented minorities in engineering programs would solve D&I problems (Bowman, 2012). Merely addressing surface-level representational issues has done little to change the everyday experiences that students face, as these changes ignore "the reality of interpersonal racism, sexism, classism, homophobia, and so forth that a person might encounter on a day-to-day basis" (Lee, 2019, p. 10). Despite millions of dollars and countless interventions, engineering still considers D&I peripheral to the technical training and solutions it generates. Engineering provides a meaningful context to explore the wicked problem of D&I because it spotlights ongoing D&I issues that exist in most organizational cultures, even if these issues are not as pronounced or obvious as they are in engineering. As such, we consider D&I issues within organizational cultures of engineering programs to be wicked problems that can be mitigated using design thinking. Design thinking creates new ways of doing, thinking about, valuing, and operationalizing difficult conversations that can lead to productive change (Buzzanell, 2017).

To explore the possibilities of design thinking in facilitating difficult conversations toward fostering organizational change in undergraduate engineering programs, we offer a contrastive case studies of (a) the biomedical engineering (BME) program and (b) the electrical and computer engineering (ECE) program at a large, research-oriented, Midwestern university. Our study examined on design participants' perceptions of their experiences engaging in conversations structured through design thinking phases focused on solving enduring organizational problems. We highlight participants' perspectives of their experiences and observed interactions by drawing on communication as design (CAD). According to Aakhus (2007), CAD "happens when there is an intervention into some ongoing activity through the invention of techniques, devices, and procedures that aim to redesign interactivity and thus shape the possibilities for communication" (p. 112). CAD is specifically applicable to communication problems like D&I and can strengthen the difficult conversations and conflict angles that emerge. Moreover, the cases examine how the design process illuminates participants' understandings of everyday talk, interactions, practices, and norms toward change processes that are constituted vis-à-vis the university's engineering cultures. Given that much of engineering privileges technical skill and task completion, we examine how design thinking disrupts (or not) the everyday discourses and larger professional and societal Discourses that inform and are informed by the engineering discipline (for d/Discourses, see Fairhurst & Putnam, 2019). By examining how design thinking can be leveraged to create opportunities

[1]Intractable conflicts are a type of conflict that are "entrenched in cognitive, affective, and social-structural mechanisms, a transformation that effectively distances the conflict from the perceived incompatibilities that launched it" (Vallacher, Coleman, Nowak, & Bui-Wrzosinska, 2010, p. 262).

wherein difficult, productive, and needed conversations can occur, we aim to understand how to cultivate organizational change related to recurring wicked problems of D&I in engineering. Thus, our study presents a framework for engaging similar issues in a variety of STEM-based organizational and educational contexts as well as important considerations for understanding how organizational cultures can empower or constrain change efforts.

In what follows, we start by contextualizing our choice for focusing on engineering educational culture and then provide a literature review of design studies in communication and discuss their linkage to organizational culture research. From there, we describe and analyze interviews with members of both programs after they participated in design interventions. In our analysis, we explore participants' perceptions of design processes toward facilitating difficult conversations that are necessary toward inclusionary change. We conclude by offering both theoretical and practical insights into the use of design thinking processes in fostering inclusionary change.

Background

Engineering organizational cultures both reinforce and promote wicked problems and conflicts. In engineering, challenges pertaining to D&I (particularly surrounding gender and race) have persisted despite efforts to address these issues (Falkenheim, Burke, Muhlberger, & Hale, 2017). These issues are often reproductions coalesced around cultural ideals of *who* can be an engineer and *what* knowledge and skills count as engineering (Faulkner, 2009a, 2009b; Godfrey & Parker, 2010). For example, engineering cultures are characterized by linear epistemologies, dualistic approaches to problem-solving, and hierarchical ways of designing, wherein "hard" skills (e.g., technical knowledge) are often privileged above the "soft" (e.g., communication skills or teamwork; Godfrey & Parker, 2010). As these norms reflect cultural assumptions of masculinity, traditional engineering cultures are gendered "masculine" (Faulkner, 2009a, 2009b). Countless studies have showcased how women often undergo identity negotiations to fit into a chilly climate. In her study of undergraduate engineering programs, Tonso (2006) showcased that women often negotiated an invisibility–visibility paradox wherein they "were hypervisible on campus but were in time made invisible as members" of the engineering community (p. 292). Other studies have supported Tonso's claims by illustrating similar gendered dynamics (Dryburgh, 1999; Faulkner, 2009a, 2009b; Godfrey, 2007; Tonso, 2006). Engineering cultures are also racialized, as most students that matriculate in engineering programs are white (Long & Mejia, 2016; Pawley, 2019).

Demographic representations of engineering cultures matter inasmuch as they highlight the organizational realities that can cultivate and promote wicked organizational problems. ECE organizational cultures can be traced to historical moments and events (Jesiek & Jamieson, 2017). Since the late 1800s, technological innovations and evolutions have resulted in recurring disciplinary fragmentations wherein electrical and computer engineers have become increasingly specialized and siloed. These fragmentations have impacted ECE cultures throughout engineering programs as they promote "negative stereotypes and masculine cultural dynamics in. . .both school and workplace settings" (Jesiek & Jamieson, 2017, p. 4570). Although BME cultures have better gender representation than other engineering fields, BME suffers from a racially homogenous population wherein most bachelor's degrees are awarded to white students (Chesler, 2019; Corple, Zoltowski, Eddington, Brightman, & Buzzanell, 2019; Yoder, 2019). Despite efforts to address the ongoing D&I issues, both ECE and BME are impacted by recurring cultural dynamics that continue to promote exclusionary norms and ideals of what knowledge is valued and who can be an engineer.

Design and Communication

Design interventions are processes that solve problems using design practices. Examples of design interventions include attempts to solve business problems using design tools (e.g., empathy maps, customer journey maps, and "how/why" laddering)[2] and practices (e.g., rapid prototyping, brainstorming, and visualization of ideas) that have been useful in organizational transformation (Brown, 2008; Lewrick, Link, & Leifer, 2018). By using these tools and practices, design can be leveraged to help envision and prototype innovations, solutions, and possibilities for real, complex, and ill-defined problems (Elsbach & Stigliani, 2018; Jackson & Aakhus, 2014). Less studied, though, is the impact of communicative design processes toward facilitating difficult conversations to address intractable problems in organizational settings (e.g., D&I; Buzzanell, 2017).

The fields of management and organizational studies have utilized design processes since the 1960s and documented many benefits. For example, design thinking can positively impact growth, profitability, and innovation in organizations (Buchanan, 2015; Elsbach & Stigliani, 2018). Others have utilized design processes and tools to address ongoing conflicts and challenges in organizations (Chang, Kim, & Joo, 2013; Galli & Suteu, 2013). Design thinking models and rationales that are applicable to management focus on the benefits of design tools; however, in this study, we adopt a CAD approach. CAD highlights gaps between current states (what communication is) and desired states (what communication ought to be) and fosters communicative conditions wherein this gap can be minimized or eliminated (Aakhus, 2007). In other words, CAD "prompts us to consider not only how and why communication messages, flows, formats, and tools emerge and are, but also how and why such communicative phenomena are designed and influence the interactivity that comprises organizational life" (Barbour, Gill, & Barge, 2018, p. 2). Communication scholars often present design (and design thinking) as quasi-metatheoretical approaches for studying the nature of design as a communicative act, thus "investigating the social world from the standpoint of communication" (Aakhus, 2007, p. 112).

In doing so, communicative design studies often privilege micro- and mesolevels of inquiry (e.g., interactional and group-level discourse) over the study of macrolevels of inquiry (e.g., disciplinary or institutional structures and Discourses). On microlevels, CAD has been utilized as a "bridge" between theory and practice in understanding the effectiveness of organ donation campaigns on patrons of departments of motor vehicles (Harrison, 2014). In challenging the theory/practice debate, Harrison (2014) notes that effective design "is about embracing the notion that our best ideas and attempts can go wrong, and we should constantly be looking for signs that something unexpected is occurring" (p. 147).

On mesolevels, two studies showcased how CAD has been adopted. First, CAD has been studied through the lens of argumentation and conflict in online cancer communities (Aakhus & Rumsey, 2010). Aakhus and Rumsey (2010) adopted a communication-as-design analysis that uncovered how social support is crafted through various forms of conflict that emerged in and throughout discussion forums of an online cancer support community. The present study builds from this use of CAD by exploring how design processes might be leveraged to address and mitigate enduring and wicked conflicts that exist in and throughout organizational cultures by providing a framework that fosters conversations wherein productive conflict might emerge. Second, CAD has been utilized in organizing and designing learning spaces (Thompson, Steier, & Ostrenko, 2014). In their study, Thompson et al. (2014) argued that design fosters unique communication processes that encourage participation, reflection on experiences, and the emergence of a "language of design" that is coconstructed by designers and stakeholders of the learning space.

[2]"How/Why" laddering is a tool used to help get at deeper issues in the design process by foregrounding "why" questions, which address more abstract concepts and issues that exist in the design problem ("How/Why Laddering," n.d.).

As these three studies illuminate, the CAD perspective is rife with possibilities for scholarly inquiry focused on change processes and possibilities in organizational settings; however, absent is the explicit role of CAD in transforming organizational cultures. Given persistent and enduring conflicts that exist at the macrolevel of disciplinary cultures within engineering programs, we are interested in exploring how design thinking can be leveraged to address and mitigate d/Discursive conflicts surrounding D&I.[3] Our approach builds on CAD by examining how organizational cultures shape the possibilities of design processes to facilitate difficult conversations and address these forms of conflicts in organizations. That is, we view CAD as a form of organizational communication wherein design may be used to support cultural change and innovation within organizations.

Organizational Cultures

To enact organizational cultural change using design, it is necessary to understand how organizational cultures are communicatively constituted. The concept of "organizational culture" has been widely defined and contested; however, we borrow from Parker's (2000) definition that describes organizational culture as "locally produced by people, but. . .usefully talked about as a thing with particular effects on people" (p. 83). Organizational cultures are not only interactively produced by organizational members but are also (re)produced by collective understanding and interpretations of organizational rules, norms, and values (Keyton, 2011; Schein, 2004).

Often, various subcultures are fraught with conflict in trying to define organizational realities and are a "continually contested process of making claims of difference within and between groups of people who are formally constituted as members of a defined group" (Parker, 2000, p. 233). The formulation of cultural conflicts often depends on whose perspective frames various aspects of the conflict (Coyne, 2005; Paul, Geddes, Jones, & Donohue, 2016). As in any organizational culture, recurring conflicts are often products of subcultures clashing with one another. Clashing subcultures create in-group and outgroup dynamics that can amplify D&I issues, thus creating intractable problems saturated with ongoing power struggles (Mumby & Clair, 1997).

Wicked problems are "loosely formulated. . .[with] no "stopping rule". . .and are subject to redefinition and resolution in different ways over time," and are present in a variety of organizations and organizational cultures (Coyne, 2005, p. 6). Although wicked problems may not begin as such, throughout their evolution and redefinition, they "become protracted through escalation, negative sentiment, and hostile cognitions that change the interactions and the dynamics" of the problem (Gray et al., 2007, p. 1416). In our study, we focus on the intractable nature of D&I as a wicked problem in engineering cultures. D&I is tied to professional practice and needs to integrate social identities into engineering workplace identities (Zoltowski et al., 2017). Put differently, these sorts of wicked problems are also intractable in that they are "protracted, persistent, destructive, and deeply rooted in ideological and material structures" (Buzzanell, 2017, p. 1633). Thus, despite efforts to address facets of D&I issues, their existence within engineering programs continues (Zoltowski et al., 2017).

Fields like BME and ECE have integrated design processes in both instruction and curricula (Dym, 1999); therefore, engineering poses a context amenable to using design thinking as a process that supports organizational cultural change related to D&I (Eddington, Zoltowski, Brightman, Corple, & Buzzanell, 2019). In the case of organizational cultural change, design interventions might include adopting design thinking approaches to help bolster organizational innovations (Brown, 2008, 2009) or cultivating leadership and management skills to positively impact an organization (Martin, 2007). To more deeply and centrally respond to and mitigate ongoing D&I problems within engineering, this study investigates

[3]We use d/D to distinguish between Discourses (ideologies that organize social institutions like colleges and universities) and discourses (everyday talk and interactions) (Fairhurst & Putnam, 2019).

how design interventions might be useful toward addressing engineering's wicked problems. As such, we ask the following research question:

RQ1: What are design session participants' perceptions of the use of design toward facilitating difficult conversations aimed at productive and inclusionary change?

Method

This present study is part of a larger, three-year National Science Foundation funded project that applies design principles to transform organizational cultures of engineering. In this article, we examine the impact of design toward addressing these issues in BME and ECE programs by interviewing participants following their participation in design sessions. Additionally, we supplemented the interview data with video-recorded observations of the design sessions, artifacts collected from the design sessions, and field notes. In the 2017–2018 academic year, we conducted six design sessions for both BME and ECE. The design sessions brought together various school stakeholders (e.g., faculty, staff, undergraduate and graduate students, and alumni) to create prototype solutions to organizational issues pertaining to both schools. Following both the BME and ECE design sessions, we conducted interviews with twelve participants in BME, and seven participants in ECE to understand their experiences within the process.

Design Sessions & Participants

The design sessions refer to a series of 12 meetings (six sessions in BME in the Fall 2017 semester; six sessions in ECE in the Spring 2018 semester) that occurred over the 2017–2018 academic year (see Table 1). All sessions were organized and facilitated by expert members of the research team that have nearly three decades of experience in teaching, leading, and utilizing design efforts in both industry and academic settings. The curriculum was created using a variety of design materials and templates from sources including Stanford's d.school ("Tools for taking action", n.d.) and consultations with an alumna of the ECE School who had 30+ years of professional design work at an international automotive company. Each design session cohort included stakeholders as designers (e.g., faculty, staff, undergraduate and graduate students, alumni, postdoctoral scholars, administrators from the campus intercultural centers, and members from the research team) from both the BME (Fall 2017) and ECE (Spring 2018) programs. Table 1 briefly describes the six-session template used for both BME and ECE.

At the end of both the BME and ECE design sessions, the design stakeholders developed initial prototype solutions aimed at addressing the interconnected issues of D&I, preparation for professional practice, and creating a more integrated sociotechnical understanding of engineering within both programs. The BME stakeholders developed four solutions to address these issues: (a) a multifaceted outreach and recruitment program; (b) a stronger definition of BME identity; (c) a mentoring program; and (d) an ongoing D&I assessment program. The ECE stakeholders developed three solutions to address these issues within their program: (a) a teaching assistant training aimed at addressing intercultural student interactions; (b) a junior-level professional development seminar, and (c) integration of multidisciplinary and vertically integrated design experiences throughout the ECE curriculum.

Data Collection

Following the design sessions for both BME and ECE cohorts, we interviewed 19 design participants from BME and ECE. The research team conducted interviews with 12 BME participants (six faculty members, three staff members, and three students), who represented 80% of the BME design cohort. We also conducted interviews with seven ECE participants (one alumna, one graduate student, two undergraduate students, two staff members, and one faculty member), which represented 32% of the ECE

Table 1
Design Session Descriptions

Design session	Topic/goal	Key activities
Design Session 1	Understanding one's professional journey	Mapping individuals' professional journey
Design Session 2	Understanding diversity and inclusion issues in BME & ECE	Reflecting on professional journey maps, creating prototypical journey maps
Design Session 3	Understanding diversity and inclusion issues in the BME & ECE contexts	Discussing research team's interview study from the prior year
Design Session 4	Creating design challenges based on problem scoping/framing from design sessions 1–3	Brainstorming potential components of solutions that could address the D&I issues in BME & ECE using "How/Why" Laddering
Design Session 5	Developing design challenges	Consolidating components of the design challenges into an implementable solution
Design Session 6	Presenting prototype solutions that address D&I issues in BME & ECE	Developing an implementation plan for the solution, presenting to the Design Session participants

design cohort. The study utilized semistructured interviews to understand participants' perceptions of their experiences in the design sessions. Participants were interviewed regarding their perception of the design sessions (e.g., "What did you think about the design sessions?" "What did you think about this approach?"), the design sessions' connections to D&I ("How did the design sessions illuminate systemic barriers in [BME/ECE]"), and recommendations for improving the design sessions. Interviews averaged 33 min per interview, and were transcribed by a third-party transcription service, which generated 274 single-spaced pages of interview text (an average of 13.05 pages per interview). The interviews were deidentified, and participants were given pseudonyms to protect their identities. All identifiable information in the interviews was removed. The secondary data came from two key places. First, to supplement the interview data, the first author's notes and observations from both the BME and ECE design sessions and interviews were used. Second, design session artifacts and video recordings were also referenced to further contextualize the participants' descriptions and experiences. All study protocols and materials were approved by IRB.

Data Analysis

Organizational culture is not necessarily revealed in isolation; rather, it is revealed in and by individuals' shared understanding of experiences (Keyton, 2014). We analyzed the 19 interviews using a constant comparative method (Corbin & Strauss, 2015). During the first round of coding, the first author read through each interview line by line, making notes of initial codes that appeared in the transcripts in NVivo. In the second round of coding, initial codes were grouped into broader categories or themes. For instance, initial codes like "vulnerability in sharing stories," "new perspectives on D&I," and "evolution of a narrow definition of D&I" were grouped into categories like "Design sessions fostering a deeper understanding of D&I issues."

The first author paid attention to sensitizing issues, descriptions, and experiences where the effectiveness of topics, conversations, and activities surrounding the design process was mentioned. Throughout the analysis process, he also referred to: observational notes that he made as a cofacilitator of the design sessions; audio recordings of the design sessions' artifacts from the design sessions; and video data of the design sessions that provide a deeper context for momentary interactions shared by the BME and ECE design cohorts. Taken together, these moments throughout the interviews and observations provide insights into how both BME and ECE organizational cultures impact, embrace, and integrate change possibilities through design.

To ensure the accuracy of themes, the results were discussed with the other authors and the design session participants for further refinement and clarity. Through several meetings, the research team read through transcripts, discussed emerging findings, and engaged in iterative mapping of codes to refine the themes. All researchers were familiar with design, organizational issues, and have worked in engineering education, biomedical engineering, and/or electrical engineering. In the next section, we share the results of the thematic analyses framed within the two contexts of BME and ECE.

Results

Our analysis uncovered two themes related to how the cultures of both BME and ECE shaped the design cohorts' sense of agency to effect change, and where change occurred within these cultures (e.g., organizational or individual levels). We highlight how the design process surfaced a variety of difficult conversations that both reflect and are shaped by their experiences within two contrasting organizational cultures.

Organizational Cultures Impacted How Participants Viewed Design Change Efforts

Participants from both BME and ECE shared insights into the organizational cultures of their programs that revealed tensions regarding design change efforts. On one hand, participants from BME portrayed their culture as one defined by youth, openness, collaboration, and gender diversity. As such, they seemed to embrace the change possibilities unearthed by the design sessions. On the other hand, participants from ECE described their culture as traditional, and rooted in a long history of practices and knowledge bases. As such, structural change generated vis-à-vis design was met with confusion, uncertainty, and hesitation.

The BME Organizational Culture: Novelty, Community, and Optimism toward Change

The BME Design Session participants revealed a variety of descriptions of the organizational culture organized around notions of a young "community"—namely one that values gender diversity, teamwork, and difference. Regarding BME's gender diversity, Brenda, an academic advisor, shared that BME actively promotes, "a good gender balance, which I know some of the other engineering schools don't have." Brenda also added, "that right there helps to provide a baseline to build on in diversity. Because you do get women, females who see things a bit differently than males." In contrast to the other programs at the university, the presence of female students and faculty enabled a BME culture that is considered very different. Additionally, Bodhi, a staff member and laboratory course coordinator for BME, argued that BME also promotes teamwork throughout the undergraduate curriculum: "From doing our assessment and looking and senior surveys and alumni surveys, it's usually one of the main points that students bring up that they appreciate they were able to do a lot of group work." Finally, Betty, an assistant professor, noted that the BME program integrates a variety of skillsets and backgrounds throughout coursework. She argued that these were crucial for BMEs to embrace in their professional careers: "We do a lot with teamwork and trying to get people to work together. . .we're trying to get nurses and industrial engineers and other programs together to just see their viewpoints."

Biomedical engineering participants noted that the design process utilized a language common to engineers that helped to facilitate different kinds of conversations that were empowering and engaging. Because of the design tools and conversations, participants felt as if they were able to make sense of and address D&I issues. For instance, in the design process, Brad found comfort in being able to reframe difficult issues and conversations into an "engineering problem." To explain, he added, "You take your basic principles, define a system, your boundaries, and say 'how can I fix x?' Or 'what is x?'" Others like Bella, a senior in BME, declared that the design process inspired new ways of thinking and talking about abstract or nontechnical issues that should be essential for all engineers:

> We made things empirical in a manner that I would never have thought to make them empirical, which is great. I feel like we should do design processes in all of our engineering classes, honestly, because if you thought about engineering problems in this way, I know this sounds stupid, we could solve world hunger.

As Bella notes, design facilitated different kinds of conversations—ones that could even solve world hunger. Similarly, both participants remarked that the design process prompted new ways to engage in conversations regarding D&I by making them "empirical" or an "engineering problem"—a common language for engineers.

Participants described that the design process helped to encourage a sense of community with other stakeholders. Brody, an administrator in BME, shared,

> The diversity of voices asking and talking about [BME issues] was insightful for me. I heard other voice from students, from other faculty members, from staff members that brought aspects of diversity and inclusion in the professional formation to my attention in ways that I hadn't really thought about it even as an administrator, even as someone who's overseeing the curriculum development and the program development almost from the beginning.

The "diversity of voices" led to new ways of talking about and thinking about D&I interventions and solutions. During the design sessions, these conversations occurred in small and large group activities and discussions. Additionally, facilitators provided opportunities for participants to journal, given anonymous feedback, and pose questions for their cohort. Those opportunities enabled participants to develop skills for initiating difficult conversations and working out productive approaches to conflictual situations, such as advocating for greater diversity and inclusivity of members and practices in engineering. Because of these efforts, participants referred to the openness and willingness to be vulnerable and share their experiences. Bianca, a sophomore in BME, shared the following:

> I also kind of liked how we had. . .a fairly big group for things, but we broke it down into smaller groups. I think being one of the youngest ones in the room, it was kind of intimidating to talk in front of everyone, so I felt like a lot more ideas could be thrown out there.

Thus, on a practical level, the design process leveraged different modalities (e.g., large and small group discussion, journaling, anonymous feedback, and Q&As) to approach difficult conversations of diversity and inclusion from multiple angles and in ways that appealed to different personalities and social locations. As evidenced in Bianca's feedback, tools such as small group discussions made her feel more comfortable sharing her experiences or perspectives, especially when communicating with those of different ranks, ages, genders, nationalities, and races or ethnicities.

Finally, the design process helped to foster a sense of shared optimism about the possibilities for change in BME. For instance, Bruce described the process as "a rebellion" and a "barrier-busting initiative" against traditional approaches to solving D&I problems in engineering. As the following statement showcases, Bruce demonstrates excitement in how he frames the design process:

> [The project] is really a rebellion. . .against the notion that you can just delegate minority recruiting to [the Associate Director of the Minority in Engineering Program] and let him worry about it. And what [the research team is] trying to say is that if you approach it with this design mind, you'll realize that designing something that's attractive to everybody–total logically speaking–is to design something that's attractive to everybody. And, if you design something that's attractive to everybody, it's going to pull in minorities. . .as long as you don't shut them out and have barriers. The idea is you have your barrier-busting initiatives.

Thus, Bruce's comment demonstrates that design thinking challenges surface-level responses to "fixing" diversity and inclusion in educational settings. The design process's deep dives into participants' lived experiences (e.g., journey maps), helped to encourage empathy and understanding, as Bianca described, to "talk about things that we didn't always want to talk about."

The journey map exercise allowed participants to chart their personal and professional journeys in engineering, and gave attention to pain points (e.g., moments of failure, frustration, or negative experiences) and moments that matter (e.g., moments of success, importance, or positive experiences) in order to facilitate conversations about diversity and inclusion (Figure 1). Bianca described the activity in the following way, "I thought that was really important that we did that activity. . .and how those contributed to our experiences and more diversity. . .It's something that I had never done before, so I thought I learned a lot about that." Several participants shared that this activity helped to foster conversations that address systemic—instead of surface—problems of diversity and inclusion. Thus, the BME culture promoted and enabled conditions wherein designers felt empowered by the change possibilities cultivated in and through the design process. As a result, the BME cohort addressed larger-scale, cultural problems within BME—in this case, trying to more clearly define the BME organizational identity while increasing diverse representation in the program.

The ECE Organizational Culture: Uncertainty, Discomfort, and Skepticism toward Change

Whereas the BME participants referred to the design processes optimistically, the ECE design session participants struggled to design for change within an established, well-defined organizational culture (Jesiek & Jamieson, 2017). Regarding its composition, the ECE program has one of the largest student populations within the university's engineering program, a high number of international students (nearly 40 percent), and a low number of women (Eddington, et al., 2018). Because ECE promotes an individualistic and competition-oriented organizational culture, participants articulated discomfort, uncertainty, and skepticism toward the effects of the design process.

First, the ECE participants had difficulty valuing or understanding how design could be leveraged to address D&I problems in ECE. Rather than finding its open-endedness inspiring or "rebellious," ECE participants considered it confusing. Claudia, a junior in electrical engineering, shared,

> Sometimes there was a lack of clarity of the goal of the discussion that we were going towards. . .I think a bit more organization on that would be helpful. You don't want to restrict the conversation, but [make sure] people kind of know what the angle of what they're talking about.

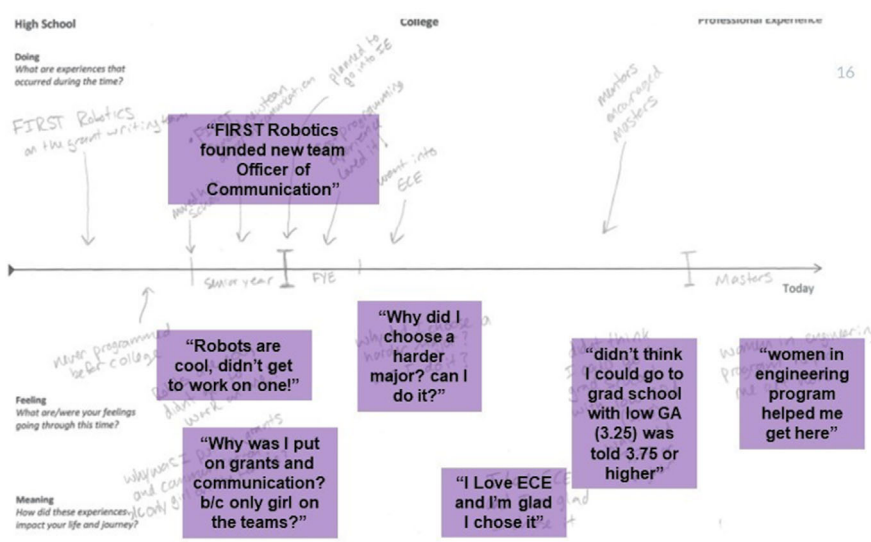

Figure 1. Example of journey map worksheet from ECE.

Others noted some discomfort with the iterative nature of the design process. Cordelia, a senior in electrical engineering, found the iterative conversations to be unfocused. She recalled, "A lot of times we would just beat around the bush and talk about the same idea multiple times and spread it out to three different things, but it could be incorporated into one major topic." Thus, the iterative, ongoing conversations within the design process clashed with the established norms of the ECE culture (e.g., linear problem-solving and efficiency).

Finally, the possibilities for the design process to effect change were met with skepticism. For example, Christy, a graduate student in computer engineering, was skeptical of an ECE prototype solution: a junior-level professional development seminar. This solution emerged because of identifying gaps in the ECE student's D&I experiences in the classroom. Christy described,

> It's easy to talk about diversity and inclusion, but what kind of changes will be done? So, what changes will be made to the 200, 300, 400 seminars? Will bias training be provided? I think it's pretty simple to do training online, like the implicit bias tests and just education like that. I don't know how effective online training is, that's not something we talked about. But could that kind of stuff be done to TAs and professors. . .I'd like to see that there's someone thinking about it, but I'm skeptical on what kind of actions will be taken.

In the excerpt, Christy targeted her skepticism at only having students partake in the D&I experiences, as opposed to key administrators and faculty members involved in design session conversations and the implementation of the solutions. Absent these participants, she communicates a skepticism toward effecting meaningful and sustained change in ECE. Although participants believed the design sessions were useful in cultivating a critical awareness of D&I issues in ECE by facilitating difficult and needed conversations, participants also acknowledged a perceived lack of agency toward addressing structural changes in the program.

Organizational Cultures both Empowered and Constrained What Participants Viewed as Possible

In both cohorts, design worked to amplify diverse voices and experiences that deepened participants' understanding of D&I. In BME, participants shared excitement toward addressing macrolevel problems related to missing voices and perspectives (e.g., underrepresented minorities and military veterans). Conversely, although important aspects of D&I in ECE were made visible (e.g., gender issues and socioeconomic issues), the participants also recognized power dynamics at play, which minimized certain voices and experiences in the ECE sessions. Whereas participants from both BME and ECE recognized the absence of key stakeholders and voices in the design sessions, in ECE participants seemingly felt disempowered to make structural change because of them, resulting in design solutions targeting micro- and interactional levels of the ECE culture.

Diversity and Uniformity of Voices

With a diversity of stakeholders in the design sessions (e.g., students, faculty, staff, administrators, and department leadership), BME participants appeared to be motivated by the process to address macro, organizational changes. For example, Brody's earlier quote about the "diversity of voices" inspired him to address structural changes in BME. Thus, interviews focused on participants' experiences using design tools, activities, and small group conversations to foster productive change. Some participants referenced tools like "how/why" laddering that helped scope issues and solutions (see Figure 2). As Bella described, "You make these abstract things empirical, and now you have a way of actually navigating through them in a logical manner. If not, it's just a rant. You make a rant into something more than a rant, and that's great." Bella refers to how the tools and the process of design helped navigate difficult topics ("rants") into actionable and productive change.

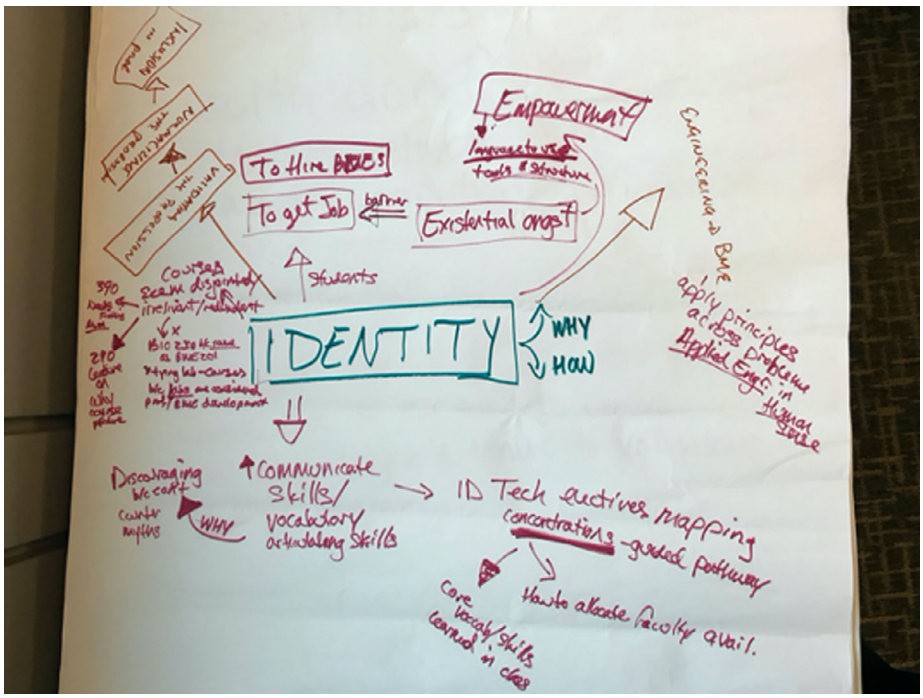

Figure 2. "How/Why" ladder artifact from BME.

Alternatively, the problems that were unearthed and discussed in both the ECE design sessions and the interviews were endemic of broader, recurring concerns. Compared to BME, participants throughout the interviews often focused on whose participation was missing from the design sessions (e.g., male students, international students, faculty, and senior administrators). As Cordelia described,

> There were a lot of women [in the design sessions], and it's not representative of ECE because there's not a lot of women, so I feel like it would've been more helpful to have more males there just because they are a majority of [ECE].

Absent these voices, participants often communicated a lack of agency to create broader organizational change in ECE. Thus, it appeared that change would only be made possible on an individual or interactional level. Building upon the impact of the organizational culture, efforts to address problems both BME and ECE often centered on (a) amplifying and minimizing voices and (b) how/where to enact change.

The Role of Design in Amplifying and Minimizing Voices

The BME design participants looked outward to envision a diverse and inclusive future BME culture. That is, they were interested in larger structural changes that could be implemented to increase the diversity of the BME program. One activity that was frequently referenced in both cohorts that helped think about different perspectives and experiences was the journey map activity. Bella, an undergraduate woman of color in BME, described the journey map in the following way:

> I didn't think that my experience with the lack of diversity and the lack of just making room for that was as universal as it was, or that other people who were so different from me would have felt the same way. That itself was interesting to know, and that diversity, or the lack of it, could affect just anybody. . .I'm an undergrad. I feel like you know what, that makes sense. It's not diverse, but then you realize it's the same for faculty and staff. It's the same for grad students. It affects everybody.

As Bella notes, the journey maps allowed her to realize that not only students but also faculty and staff cared about (and were impacted by) the "lack of diversity" in BME. Thus, the journey maps created opportunities for both connection and ongoing conversations with others that Bella assumed were different from her. For others like Brody, a BME administrator and faculty member, the journey maps were an important part of understanding new aspects of diversity and inclusion as well. He shared that the journey maps were "a key change factor. It brought out issues that I hadn't thought about. It made powerful narratives that I think impacted me. Certainly, maybe impacted others as well. Confronted me with new thinking." Using different design tools to encourage conversation, participants noted that the design process encouraged reflexivity that then prompted further conversations about D&I in BME. These difficult conversations occurred particularly as individuals shared their journey maps because participants began to empathize and understand others' perspectives and experiences, thus making topics like D&I easier to talk about in the design sessions.

The design processes also fostered opportunities for participants to be vulnerable with one another. Moments wherein participants shared their own stories shed light on the possibilities for encouraging empathy and understanding of individuals' experiences. For example, Buck shared his experience in BME as a military veteran, which was mentioned throughout all the interviews. Bruce, a faculty member in BME, called Buck's story "enlightening." Bruce further explained,

> The thing that I think that we uncovered, which that there were several unappreciated minorities that are not classically defined and one of them [Buck] came up with and that's veterans. . .Veterans are a minority and the cool thing about them is they've had military training and they have discipline, and they have the maturity, and they could be successful. Plus, the US military is one of the most integrated institutions in the nation.

Thus, these excerpts suggest design thinking is a particularly helpful way to engage in difficult conversations by creating prompts and tools that fostered new and alternative possibilities for inclusion in the BME organizational culture, as seen in the rich recounting of experiences through the journey map activity enabling others to enter speakers' realities.

Whereas BME looked outward regarding their design solutions, in ECE, participants focused on different, microlevel strategies to better the everyday experiences of ECE members. Specifically, the design sessions' discussions amplified the gendered and class-based experiences of members in the ECE population. Esme, a staff member and instructor in ECE, shared that the design sessions highlighted how women in ECE feel "like their voices were not as valued." Noted by several participants (including Esme), diverse perspectives frequently surfaced in small group discussion and were shared with the larger group. Regarding socioeconomic issues, Claudia recalled the experience of Credence, a graduate student in ECE, that was shared:

> I remember [Credence], talking about the financial burden of college and how he wasn't as financially secure. And I think that's something. Because I'm financially secure going into college. . .and I can definitely see how that would impact your ECE experience.

Credence's willingness to share this perspective in both small and large group discussions was a meaningful moment wherein the difficult (and hidden) reality of student life was made visible. In effect, the ECE design session participants all noted that the design process cultivated a critical awareness of (in)visible facets of D&I that are experienced daily within ECE.

Despite the promise and potential of design in fostering empathic understanding, two of the ECE participants recalled moments where others minimized voices. For example, Christy recalled a moment of frustration when she attempted to discuss an empathy map activity, "I was ready to talk about it, but then [other participants] rolled their eyes at it and they went back to the first topic and we didn't end up discussing that part at all." Additionally, throughout her interview, Christy referred to other instances where she wanted to speak up but perceived that she could not voice her concerns or perspectives. In her design journal, Christy wrote that she was "not surprised" that her group "did not want to discuss other

voices." Similarly, Ethan, an assistant professor in ECE, was hyperaware of power differences among stakeholders that were present in the design sessions: "There are people in this group who are quite influential in my ultimate employment." Both Christy and Ethan reference gendered and hierarchical power dynamics at play among the participants that constrained the possibilities of the design process to facilitate conversations from diverse perspectives. In effect, ECE's cultural dynamics potentially only allowed some issues to be surfaced while minimizing others.

How and Where Change Occurs

BME Organizational Identity. The question of "What is a BME?" became a central and enduring question throughout the design sessions and interviews (see Figure 3). For some like Bella, it was comforting to know that others struggled with that question. She shared,

> I didn't think everyone or anyone else struggled with that but having that revealed through the design sessions, again, that was interesting, and just for different people, it's been . . . for almost everyone . . . it's been an identity crisis being in BME, isn't it?

Throughout the interviews, several participants referenced the importance of clearly defining the BME identity as it pertained to recruiting both a diverse population.

For some, the ambiguous BME identity was a product of the program's (and industry's) youth. As Bianca shared, "It's really hard to articulate what you know and what you're going to know by the end of your four, five years or so." Likewise, Bruce referenced the lack of BME identity as it pertained to undergraduate students' experiences in job interviews. He shared that part of the challenge in defining BME was that the field itself was "new:"

> The idea that when they went for job interviews and they said, "Well, what can you do?" . . .Everybody knows what a mechanical engineer does, he designs devices that work together, levers and pulleys and everybody

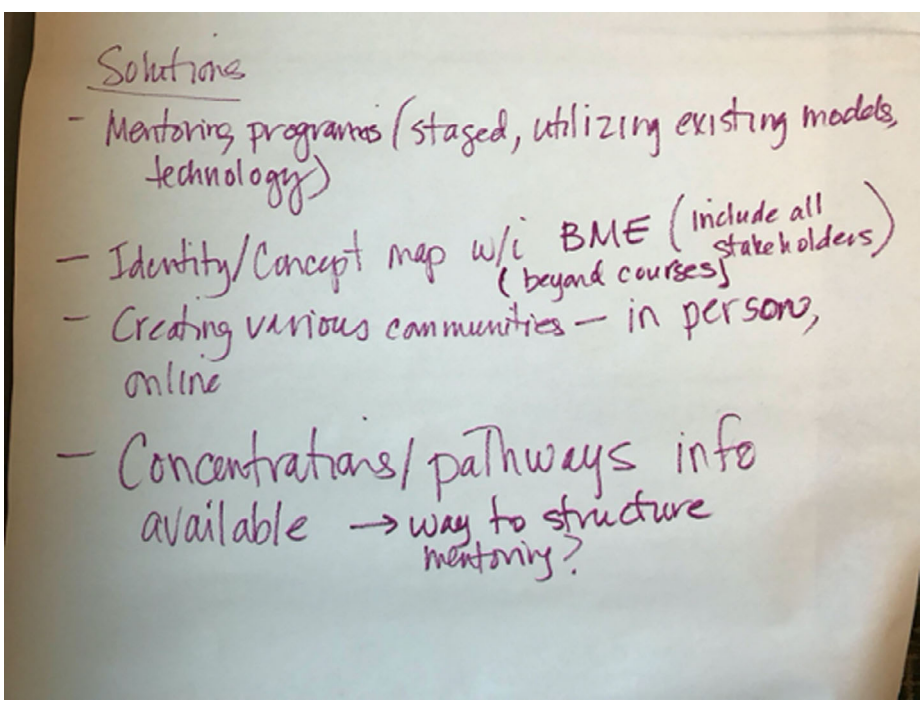

Figure 3. Prototype solutions that surfaced in the BME design sessions.

> knows what an electrical engineer does designing electric circuits. A computer engineer, well computers and all stuff like that and civil engineers build roads, bridges then okay, "What's a BME?" "Well, I don't know."

Bruce later connected BME's ambiguous identity to D&I and demographic recruitment issues. Bruce argued that the lack of clarity on what a biomedical engineer does could be preventing underrepresented minorities from considering the profession, "So if a parent of a minority student says, 'Well, I know what a mechanical engineer is and I've personally known a mechanical engineer and that's good and I know you can get a job.'" Thus, to Bruce and others, conversations within the design process uncovered the importance of BME identity in addressing larger issues of diversity and inclusion. Brody further described its connection to D&I in the following way:

> An example would be the relationship between professional identity and the way students perceive professional identity. . .and that it's part of the professional formation and it's linked to diversity and inclusion. How we define it. How we communicate it. Who gets to define it. What opportunities does it afford and what opportunities does it prevent based on the definition seems to be closely tied to the population that we're targeting and the expectations of who's going to be in the program as an example.

However, not all the participants shared a similar sentiment that addressing the organizational identity would be a useful solution. Benjamin, an administrator in the BME program argued that defining the BME identity would not "increase diversity. . .. It's just going to help [students] in a more generic way to understand their skill sets and help choose classes appropriately for their interests." Benjamin concluded that focusing on BME identity in the design sessions would be counterintuitive to focusing on D&I issues, since the solutions focusing on clarifying the BME identity did not go deep enough to address this gap. Despite this criticism, Benjamin concluded,

> It's a good thing. I want [a definition of BME] done, and we were already working on it before we got to that process. So, this process highlighted that the thing I was working on actually was really important to students, and for me, that was really gratifying

Despite Benjamin's criticisms of the purpose of this definition, the design process expanded Benjamin's understanding of different aspects of BME. His design journal included an excerpt where he wrote, the design process "expanded by thinking to include how classes are taught, which I hadn't previously really thought about as much." Thus, the design process may have offered conversations that disrupted what Benjamin had previously thought possible in BME.

Missing Stakeholders in ECE. Despite surfacing and facilitating difficult conversations, the design process in ECE was constrained by the lack of ally voices. Cordelia argued that the design sessions were not representative of the ECE population: "I think getting more males would be important. Possibly more international students as well." Others, like Ethan, desired a more politically diverse group of stakeholders, arguing,

> If you could pull in more conservative voices. . .Anything you could do to make the conversation more diverse and include people who might not otherwise subscribe to the perils of "microaggressions" in that terminology would make the outcomes more acceptable and probably be more effective.

Ethan hinted at the power dynamics ("conservative voices") in ECE that could have fostered more sustainable designs and greater change due to their position within the formal ECE hierarchy. Finally, Eula, a university administrator, described the lack of voices in the following way, "If you don't have the voices there, you don't know what's missing. . .You can't really know what that is until you get it from them." Although important aspects of the ECE culture were made visible (e.g., gender issues) through the design process, the ECE cultural norms appeared to stymy meaningful action to address these D&I problems. This finding suggests that the dominant (i.e., male and conservative) ECE culture may not support or value brainstorming solutions to diversity issues, resulting in less participants from the dominant group

and less open and vulnerable discussion from those who did participate. As a result, participants expressed a perceived lack of agency to effect cultural change within ECE. When participants perceived that their voices did not matter in addressing cultural change or they were lacking key stakeholders to gain momentum for change efforts, it is reasonable that they were skeptical of the design process and change would rest at microlevels within ECE.

Discussion

Design processes facilitated difficult and necessary conversations regarding D&I in both BME and ECE (e.g., surfacing new forms of difference through journey maps, and understanding each other's perspectives and struggles through group discussions); however, these outcomes were still shaped by organizational culture. The design process was perceived as effective in BME as the organizational culture appeared to be supportive of design efforts and designers felt a sense of agency to address large-scale change possibilities. However, within ECE, the design process was constrained by an organizational culture unsupportive of design or change. ECE's lack of support for design impacted designers' sense of agency to enact broader cultural change, and prototype efforts were designed to create more positive interactions between individuals in ECE. We offer three considerations regarding the use of design to facilitate difficult conversations to address wicked problems in organizational cultures. We then conclude with two pragmatic implications of design processes toward addressing controversial organizational topics and issues.

Three Theoretical Considerations of Design in Addressing Wicked Problems

First, organizational cultures seemingly give rise to different perceptions of individual or organizational agency to address problems and enact solutions. Nicotera and Mahon (2012) argue, "agency arises from knowledge of structure; structures arise from agency (ability to act and to apply knowledge to new contexts; Sewell, 1992). So, when rules from multiple structures are irreconcilably incompatible, agency suffers" (p. 93). Participants in the collaborative, integrative culture in BME appeared more confident that the design process could foster both structural (e.g., recruitment initiative, and assessment) and broader cultural change (e.g., an inclusive BME identity), whereas, in ECE, participants expressed skepticism about the design process as useful in addressing structural changes (e.g., missing ally voices in the design process) let alone cultural changes.

In both contexts, the design process served to illuminate the ongoing nexuses that existed within both cultures (Nicotera, 2015). Similarly, both organizational cultures impacted how and what participants found as feasible and possible. Although Elsbach and Stigliani contend, "the effective use of design thinking tools in organizations had a profound effect on organizational culture," this is only true *if* an organizational culture enables the use of design for change. As such, our study demonstrated a tightness–looseness effect within ECE and BME that impacted the perceptions of design's effectiveness toward surfacing and addressing wicked problems (Gelfand et al., 2011).[4] As Gelfand et al. (2011) contend, "tightness-looseness is manifested. . .in everyday situations in local worlds (e.g., at home, in restaurants, classrooms, public parks, libraries, the workplace) that individuals inhabit" (p. 1101). Thus, for CAD approaches to effectively address organizational conflicts, one must understand more deeply an organization's culture before attempting to foster the difficult conversations necessary to implement organizational change. Thus, the organizational cultures' tightness–looseness may impact how and where change can occur within organizations, the nature of how conflict is raised, and the overall impact of change.

[4]Tightness refers to established norms and little deviation from these norms, whereas looseness refers to an open culture with unestablished or emerging norms (Gelfand et al., 2010).

Second, we argue that the use of design thinking in organizations may provide a useful framework to illuminate how both the source (e.g., organizational cultural d/Discourses) and symptoms (e.g., D&I problems) exist within complex organizational systems. Wicked problems are often in the eye of the beholder, and design processes are one means through which to surface how, why, and where issues exist within organizations (Coyne, 2005). Thus, in order to address complex issues such as diversity and inclusion, design tools can facilitate conversations that unearth underlying assumptions that form the exclusionary cultural norms. Drawing from work on integrative conflict management systems, we argue that CAD create conditions wherein participants are able to "address [both] the source of conflict and promote conflict competence throughout the organization" (Löhr, Graef, Bonatti, Mahoo, Wambura, & Sieber, 2017, p. 339). For instance, through design processes, the ongoing questions about the BME identity were frequently identified as both a site for struggle and an underlying component of larger diversity and inclusion problems.

Thus, our adoption of design suggests that a necessary first step toward organizational change is illuminating the different "sites of struggle where different groups compete to shape the social reality of organizations that serve their own interest" (Mumby & Clair, 1997, p. 182). At times, this can be positive. In the BME context, lived experiences shared in the design sessions by members like Buck, the military veteran, or Bella, a woman of color, brought new perspectives into conversations about how to address D&I issues. Their experiences were met with openness and acceptance as their organizational culture was supportive of diverse voices. However, these types of moments can also be met with skepticism or minimized. Within the ECE context, participants shared moments where they felt barriers to sharing, their voices were minimized, or power dynamics within ECE stifled participants from diving more deeply into issues. Thus, the tightness of the ECE culture prevented participants from deeply addressing difficult conversations and topics. Because of this, ECE participants perceived that structural change may not happen; thus, design was useful in highlighting the necessity for other mechanisms (e.g., different voices and people who can advocate and champion change; Nicotera, 2015). Cultures that share similar dynamics to ECE might integrate CAD approaches throughout the educational program to uncover how and why conflicts like D&I are formed and become intractable (Malterud & Nicotera, 2020). CAD provides a unique framework that can simultaneously foster breakthroughs or breakdowns toward managing organizational communication and conflict processes (Galli & Suteu, 2013).

Third, in the design sessions, individuals' sharing of personal experiences and stories often served to inspire designers to consider new perspectives, to adopt different stances, and to practice empathy for others in their organizations. The design process and framework that we adopted contributed to increased empathy for others which served to help facilitate difficult conversations and generate positive outcomes for conflict resolution. By using design tools and processes, difficult conversations pertaining to D&I "become more human-centered, [and] designers gain greater understandings of potential users and of the design context in all its multifaceted complexities" (Buzzanell, 2017). Thus, CAD provides the framework for positive deviation and disruptions by framing wicked problems and communication more empathically (Brown & Katz, 2011).

Practical Considerations of Design in Addressing Wicked Problems

First, our use of design thinking showcases the positive disruptions that can occur as a result of the design process. As participants engaged with one another from a place of empathy and understanding, the design process disrupted and challenged traditional approaches to problem-solving. Given the central role that organizational cultural norms played throughout the ideation process, design thinking (as a framework) helped to unearth the hidden elements, needs, and realities that existed within BME and ECE (Liedtka, 2018; Löhr et al., 2017). Organizational leaders can use design thinking processes and tools to surface similar unspoken tensions, issues, and conflicts that exist in organizational settings, but they require supportive structures and frameworks to do so (Löhr et al., 2017). Absent these conditions,

design and CAD can expose needs to develop other types of support mechanisms to enable and foster difficult conversations.

Second, given the communication challenges that occur during conflict episodes, design processes aid in establishing a common language for participants, which create a decentralized conflict system structure facilitated by organizational outsiders (e.g., the research team; Löhr et al., 2017). Thus, to engage in challenging talk and experiences that may be fragmented and contradictory to stakeholders, we encourage organizational leaders to consider both the use of design frameworks to create support structures to engage, surface, and address wicked organizational conflicts, particularly as design fosters empathy, humility, and creativity (Buzzanell, 2017; Zoltowski, Oakes, & Cardella, 2012). As Thompson et al. (2014) note, "needs must become joint needs before they can be account for in the conceptual phase of design" (p. 223). Through the common language utilized in design, the issues and conflicts that exist in the organizational culture can be shared through collective stakeholders.

Limitations and Future Directions

Our study is not without its limitations. First, it is limited by its relatively small sample size. For BME, we reached 80% of the design participants; however, in ECE, our sample size was roughly a third of total design participants. As such, the absence of voices and perspectives may have resulted in a more complex (or even positive) understanding of CAD in the ECE School. Building off this limitation, both cohort participants acknowledged missing voices in their sessions that would have enriched the designers' understanding and design solutions in the sessions. As such, future research could seek to mimic these processes using a more diverse population (e.g., ethnicity, gender, background, position) to engage change in engineering educational cultures.

Conclusion

In summary, our study highlighted the possibilities of design to facilitate the difficult conversations necessary to foster inclusionary organizations; however, we did not examine these possibilities in a vacuum, rather we unpacked how the potential of design thinking is enabled or constrained by organizational culture. For example, our study showcased the positive disruption that can occur in organizational cultures with values such as novelty, community, and optimism. In a supportive organizational culture such as BME, a CAD approach offered an important starting point for addressing structural changes in the culture (e.g., policies, practices, curriculum, recruitment). Absent these conditions, change may be slow or nonexistent as microlevel strategies (e.g., trying to cultivate more positive interactions between organizational stakeholders) can only go so far. Thus, lacking a supportive culture, design changes may be unsustainable and limited to short-term solutions in which wicked cultural problems become more entrenched and intractable.

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Sean M. Eddington, Ph.D., is an Assistant Professor of Communication Studies at Kansas State University. His primary research interests exist at the intersections of organizational communication, new media technologies, gender, and organizing. Eddington's research on new media, gender, and organizing explores the intersections of gender organizing online and communicative construction of resilience. Eddington's work has been published in *Social Media + Society* and *Journal of Applied Communication Research*.

Danielle Corple, Ph.D., is an assistant professor in the Department of Communication at Wheaton College, IL. She studies organizations, media, and social change, with specific research interests in nonprofit/social enterprise communication, gender, and ethics. Her work has been published in *Information, Communication & Society*, *Big Data & Society*, and *the International Journal of Social Research Methodology*.

Patrice M. Buzzanell, Ph.D., is Professor and Chair of the Department of Communication at the University of South Florida and Endowed Visiting Professor for the School of Media and Design at Shanghai Jiaotong University. Fellow and Past President of the International Communication Association (ICA), she served as President of the Council of Communication Associations and the Organization for the Study of Communication, Language and Gender. She is a Distinguished Scholar of the National Communication Association. Her research focuses on career, work-life policy, resilience, gender, and engineering design. She is co/editor of four books and more than 210 articles and chapters, plus proceedings in engineering education and other disciplines. She received ICA's Mentorship Award and the Provost Outstanding Mentor Award at Purdue, where she was University Distinguished Professor and Endowed Chair and Director of the Susan Bulkeley Butler Center for Leadership Excellence.

Carla Zoltowski, is an assistant professor of engineering practice in the Schools of Electrical and Computer Engineering and (by courtesy) Engineering Education, and Director of the Vertically Integrated

Projects (VIP) Program within the College of Engineering at Purdue University. She holds a B.S.E.E., M.S.E.E., and Ph.D. in Engineering Education, all from Purdue. Her research interests include the professional formation of engineers, diversity, inclusion, and equity in engineering, human-centered design, engineering ethics, and leadership.

Andrew Brightman, Ph.D., serves as Assistant Head for Academic Affairs and Associate Professor of Engineering Practice in the Weldon School of Biomedical Engineering. His research background is in cellular biochemistry, tissue engineering, and engineering ethics. He is committed to developing effective pedagogies for ethical reasoning and engineering design and for increasing the diversity and inclusion of engineering education.